



(REVIEW ARTICLE)



Reducing mother's pain during childbirth in space and how the delivery will proceed during the mission

Elnaz Ghaffari *

Iran University of Medical Sciences, Tehran, Iran.

International Journal of Science and Research Archive, 2024, 13(02), 1624–1627

Publication history: Received on 15 October 2024; revised on 24 November 2024; accepted on 26 November 2024

Article DOI: <https://doi.org/10.30574/ijrsra.2024.13.2.2299>

Abstract

Childbirth in space presents unique challenges, particularly concerning the management of labor pain. According to animal studies, labor contractions in microgravity can be twice as intense, resulting in greater pain for the mother. This article explores non-pharmaceutical methods for reducing labor pain in space, given the risks associated with using pain-relief medications in such an environment. Techniques such as the Dick-Reid method, Bradley's method, remote family communication, music therapy, and controlled breathing exercises are discussed. These methods aim to substitute awareness for fear, leverage emotional support, and use sensory stimuli to alleviate pain. Furthermore, this article details an operational plan for conducting the delivery during a space mission, ensuring the safety and well-being of both the mother and the baby.

Keywords: Space; Childbirth; Multi-planet; Pioneering; Midwifery; Ethics Introduction

1. Introduction

Labor and delivery in space introduce significant challenges, particularly concerning pain management. Animal studies suggest that labor contractions can be twice as intense in microgravity, leading to increased pain for the mother. As pharmaceutical methods for pain relief pose numerous risks in space, it is essential to explore alternative techniques to alleviate labor pain effectively. Additionally, careful planning and preparation are crucial for a successful delivery during a space mission.

2. Non-Pharmaceutical Pain Relief Techniques

- **Dick-Reid Method (Natural Birth):** The Dick-Reid method focuses on substituting awareness for fear and stimulating the production of internal endorphins. This method involves educating the mother about the causes and characteristics of labor pain, teaching exercises, proper nutrition, and disease prevention. Training classes aim to replace fear with knowledge, helping the mother manage pain through understanding and preparedness. Familiarity with space science and flight experience can further reduce environmental anxiety.
- **Bradley's Method (Spousal Assisted Delivery):** Bradley's method emphasizes spousal assistance during delivery, inspired by observations of animal behavior. Remote communication with family, particularly through video calls, plays a significant role in reducing the psychological stress of being in space. Psychotherapy via telemedicine, with proven effectiveness, can also be utilized to support the mother during labor.
- **Music Therapy:** Music therapy can alleviate anxiety, stress, and pain by playing the mother's favorite music during labor. Research indicates that sounds of the ocean and sea waves are particularly soothing, making this an inexpensive and practical method for use in space.

* Corresponding author: Elnaz Ghaffari

- **Controlled Breathing Techniques:** Controlled breathing exercises at different stages of childbirth can help manage pain. However, one common issue with these techniques is hyperventilation, which can cause dry mouth and discomfort. Despite this, controlled breathing remains a viable non-pharmaceutical method for pain relief when practiced correctly.

2.1. How the Delivery Will Proceed During the Mission

2.1.1. Preparation and Monitoring

- **IV Lines and Fasting:** Two IV lines should be established for the mother-astronaut. Eight hours before the launch, the mother should fast, and the last defecation should be assisted on Earth.
- **NPO Status:** The mother should be NPO (nothing by mouth) throughout labor until the placenta is removed to prevent nausea, vomiting, and the risk of aspiration. Lip moisturizing is allowed.
- **Fluid Management:** Fluid requirements during NPO should be 100 ml per hour (dextrose 5%) to avoid overload and monitor intake/output. Adjustments may be made based on expert opinion.

2.1.2. Vital Signs Monitoring

- **Latent Phase Monitoring:** Control vital signs every 2 hours during the latent phase of labor on Earth.
- **Launch and In-Space Monitoring:** Monitor the mother's vital signs (heart rate and blood oxygen) during launch, reaching orbit, throughout labor, and return to Earth. Record blood pressure before, during, and after launch, and then every half hour. Record temperature before and after launch, and then every 3 hours. Monitor fetal heart rate (FHR) during launch, reaching orbit, and throughout labor. Monitor the neonate's vital signs after birth and return to Earth.

2.1.3. Labor and Delivery in Space

- **Bladder Monitoring:** Visualize the mother-astronaut's bladder every 1-2 hours to prevent bladder expansion.
- **Partograph Maintenance:** Maintain a partograph to monitor the progress of labor, including cervical dilatation, fetal head descent, FHR, amniotic sac status, uterine contractions, fluid intake, prescribed drugs, and maternal vital signs.
- **Pushing During Contractions:** Encourage the mother to push during contractions with a deep breath while exhaling (15 seconds max each time).
- **Warm Towels for Baby:** Warm the baby's towels under the warmer.

2.1.4. Post-Delivery Procedures

- **Hand Hygiene and Sterile Preparation:** After complete dilation, perform hand washing, apply hand rub, wear sterile gloves, and clean the perineum with a Betadine cotton ball.
- **Sterile Drapes:** Attach sterile surgical drapes to prevent them from floating in space.
- **Episiotomy:** Perform an episiotomy if necessary, preferably a midline one.
- **Delivery and Umbilical Cord Care:** After the fetus is expelled, hold the neonate's head and trunk downwards and clamp the umbilical cord with two clamps before cutting.
- **Blood Gas Analysis:** Take ABG and VBG from the umbilical cord.
- **Neonate Care:** Transfer the neonate to a warm place, clean and dry the neonate, and calculate the Apgar score at 1 and 5 minutes. Clamp the neonate's umbilical cord with two plastic clamps at a distance of 2-3 cm from the abdomen. Monitor the vital signs of the neonate and calculate Apgar score at 5 minutes. Place an identity bracelet on the neonate for post-mission identification and examination. Cover the neonate with clothes and a baby bonnet.

2.1.5. Placenta Delivery and Uterine Care

- **Placenta Separation:** After full delivery, the placenta should separate within 1 to 5 minutes. Avoid any actions to deliver the placenta to prevent uterine inversion.
- **Oxytocin Infusion:** Once the placenta is delivered, infusion of 500 cc Ringer's solution with 30 IU of oxytocin should be administered.
- **Placenta Examination:** Carefully examine the placenta for completeness.

2.1.6. First Hour After Delivery

- **Uterine Massage:** Uterine massage to ensure contraction.

- **Birth Canal Examination:** Examining and repairing any damage to the birth canal.
- **Monitoring Vital Signs:** Monitoring the mother’s vital signs.
- **NPO Status:** The mother should remain NPO for the first two hours after delivery due to the possibility of needing surgery.

2.1.7. Repairing Birth Canal Injuries

- **Stitching Techniques:** Attempt minimal damage, or address first-degree tears. Use specific stitching techniques for different tissue layers:
 - Vein head: fast-locked stitch.
 - Vaginal mucosa: fast-locked stitch.
 - Fascia: simple continuous stitch.
 - Muscle: simple singular stitch.
 - Skin: subcutaneous stitch.

2.1.8. Post-Repair Care

- **Uterine Massage:** Uterine massage after repair.
- **Perineum Cleaning:** Clean the perineum with soap and water or sterile gauze and water, then dry and apply a sanitary pad.
- **Diet and Mobilization:** The mother-astronaut should be put on a normal diet after two hours of being NPO and mobilized as soon as possible.
- **Urination Monitoring:** The mother-astronaut should urinate within six hours. If not, perform a clinical examination and possibly insert a urinary catheter and prescribe antibiotics.
- **Movement Assistance:** Ensure the mother-astronaut moves with assistance, using a treadmill if necessary.

Table 1 Stages of labor

Step 1	Latent phase Dilatation of cervix = 0-3 cm Contractions last 20-40 seconds (short and fast) and are spaced about 20 minutes apart.	First labor 6 to 8.5 hours Subsequent births 4.5 to 5.5 hours
	Active phase Dilatation of cervix = 4-7 cm Contractions last 45-60 seconds, and about 5 minutes are apart Nullipar dilation speed is 1.2 cm per hour The multipar dilation speed is 1.5 cm per hour The speed of descent in Nulli Par is 1 cm per hour Descent speed in multipar is 2 cm per hour	First delivery 6 hours Subsequent births 2 to 3 hours (4 hours)
	Intermediate phase Dilatation of cervix = 8-10 cm Contractions last 60-90 seconds, and are 1-2 minutes apart.	The average time is 5 to 15 minutes
Step 2	From full dilation to delivery of fetus in 7 consecutive movements: Engagement Descent and Flexion Internal Rotation Extension External Rotation Expulsion	First delivery: 50 minutes (Up to 2 hours will be given) Multi-parts: 20 minutes (Up to 1 hour is given)
Step 3	From the delivery of the neonate to the expulsion of the placenta: Separation of the placenta Placental discharge	5 to 30 minutes

Step 4	Immediately after the placenta is removed (beginning of the first hour after delivery, recovery)	
--------	--	--

3. Conclusion

Managing labor pain in space requires innovative and non-pharmaceutical approaches due to the unique challenges posed by the microgravity environment. Techniques such as the Dick-Reid method, Bradley's method, remote family communication, music therapy, and controlled breathing exercises offer promising solutions. These methods, combined with proper training and preparation, can effectively reduce labor pain for mothers in space, ensuring a safer and more comfortable childbirth experience. As we continue to explore the possibilities of human reproduction beyond Earth, these approaches will be crucial in addressing the challenges of space childbirth.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

- [1] Ghaffari, Elnaz. "Design a Space Mission: First Human Childbirth in Space: Transform Humanity into a Multi-Planet Species: Ghaffari, Dr. Elnaz: 9798395375445: Amazon.com: Books." Amazon.com, 2024, www.amazon.com/dp/B0C5P5L3G6/ref. Accessed 18 Oct. 2024.
- [2] Elnaz Ghaffari, et al. "Biological Nanocapsules to Prevent Osteoporosis in Astronauts during Space Travel." Civilica.com, CIVILICA, 2 Nov. 1399, civilica.com/doc/1144811/. Accessed 18 Oct. 2024.
- [3] Elnaz Ghaffari. "Checking Compliance with International Air Laws or International Space Laws in Suborbital Flights." Civilica.com, CIVILICA, 4 Dec. 1400, civilica.com/doc/1406532/. Accessed 18 Oct. 2023.
- [4] Elnaz Ghaffari, et al. "Agriculture in Space, Benefits and Challenges in the Future." Civilica.com, CIVILICA, 16 Aug. 1400, civilica.com/doc/1306359. Accessed 18 Oct. 2024.
- [5] NASA. The impact of microgravity on human physiology. NASA; 2023.
- [6] Musk E. Making humans a multi-planetary species. New Space. 2017;5(2):46-61.
- [7] SpaceX. Reusable launch systems and cost reduction. SpaceX; 2022.
- [8] Elon Musk's vision for Mars colonization. New York Times. 2021.
- [9] Ghaffari E. Spacefaring Childbirth: Pioneering human expansion. International Journal of Science and Research Archive, 2024, 13(01), 2858–2860.
- [10] Ghaffari E. Medical support systems for childbirth in space: Equipment, drugs, and practical challenges. International Journal of Science and Research Archive, 2024, 13(02), 321-330.
- [11] Ghaffari E. Case report: Balancing acts: How ADHD and Asperger syndrome complement each other in an individual's life. International Journal of Science and Research Archive, 2024, 13(02), 331-334